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EFFECT OF SOME CHEMICALS & PACKAGING MATERIALS ON SHELF LIFE OF PAPAYA CV. RANCHI

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ABSTRACT

The investigation was conducted to assess the efficacy of certain chemicals and packaging materials on ripening behavior, shelf life and quality of papaya fruits during storage. The post harvest application of different treatments, i.e., GA_3 100 ppm minimized the PLW, spoilage loss and enhanced the marketable quality like TSS, reducing and total sugar, ascorbic acid and organoleptic taste .The minimum PLW and spoilage were observed on 4^{th} days of storage and enhanced with advancement of storage period, Whereas the quality parameter like acidity and sugar was obtained minimum on 4^{th} day of storage and gradually increased up to 10^{th} day and started to decline on 13^{th} day of storage.

KEYWORDS: Shelf Life, TSS, Spoilage Loss, PLW, Acidity & Total Sugar

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Original Article

INTRODUCTION

The papaya (*Carica papaya* L.) belongs to the family Caricaceae, and originated from Tropical America. It is a tropical fruit, but grown widely in the both the tropical and sub-tropical agro-climatic zone of the world. It occupies about 24.37% of the cultivable land with the production about 32.04% (Technical Bulletin-14, IIHR, Banglore, 2015). In India; it is estimated to be around 70,300 ha. Area with 16.85 Lac tons of production and according to a rough estimate nearly 2000 ha. With annual production of 60,000 tons is under cultivation in Bihar. (Technical Bulletin papaya in Bihar, 2013)**.**Papaya gives higher production of fruits per hectare and an income next to banana (Singh, 1990) papaya is climacteric fruit (Baile *et al*., 1954) Now, It is becoming an important fruit internationally, both as a fresh fruit and as processed products. Papaya is one of the perishable fruits. It is very difficult to store for a longer period at ambient condition, which causes serious problem in marketing

Cold storage facilities are not available on a commercial scale to accommodate these types of perishable fruits due to interrupted supply of electricity and technical knowledge. As a result of the problem lies in its post harvest handling and marketing. Over mature fruits become unfit for fresh consumption as well as marketing. Fruits are also not fit for transportation to distant domestic markets. In order to enhance the shelf life of papaya it has become necessary to retard the ripening process which would help in sending papaya to distant markets by using some chemicals & packaging materials.

MATERIALS AND METHODS

The experiment was conducted in the laboratories of the Bihar Agricultural College, Sabour, Bhagalpur during the year 2007-08. The design adopted for the experiments are factorial Randomized Block Design

consisting of ten treatments replicated thrice. Fully ripe and fresh fruits cv. Ranchi of papaya was purchased from the local growers of Bhagalpur and brought to the laboratory for experimentation. Freshly harvested fully matured papaya washed in tap water and dried in shade was used for the experiment. Number of fruits per treatments were taken five. The cumulative physiological loss in weight, spoilage loss in measured in percent by using the formula at three day interval. The acidity of fruits was estimated during storage at three day intervals for all the determination the method suggested by A.O.A.C. (1970) was followed. The total soluble solids of fruits were estimated at freshly harvested fruits with the help of refractometer. Reducing and total sugars were estimated by Lane & Eynon (1923), copper titration method. The Ascorbic acid content of pulp was determined by titrating freshly extracted juice of papaya against 2, 6- dichloro- phenol indophenols dye (A.O.A.C., 1970) Marketability of fruits was determined on the basis of firmness, colour and appearance. To assess the consumer acceptability, organoleptic studies were conducted by scorecard system. The organoleptic rating was recorded on the basis of shape, colour, Shininess, firmness, texture, taste & flavor. The data recorded on different characters were analyzed statistically as the methods described by Pence and Shukhatme (1978).

RESULTS AND DISCUSSIONS

The physiological loss in weight (PLW) increased with the increasing period of storage irrespective of treatments. A similar reduction in fruit weight during storage was noted in different fruits. Calcium components reduce the PLW during storage in apple (Mason *et al.* 1975) mango (Sing *et al*. 1993, Kumar and Nagpal 1996) and in papaya (Borase *et al*, 2004, Rajkumar *et al*, 2005). The minimum physiological loss in weight treated with GA_3 in mango was observed by Singh and Singh 1992 and Borase *et al*. 2004 in papaya fruits. The PLW was minimum 12.50% with the application of GA_3 100 ppm, while maximum PLW (16.50 %) was observed on 13^{th} days of storage in control. Usually PLW increased with advancement of the storage period, it is basically dependent on temperature and relative humidity on ambient condition. (Table-1).

The Spoilage loss of fruits increased with the increase in storage period under all the treatments. Calcium components play an effective role in extending shelf life of fruits (Bangerth*etal*.1978). The minimum spoilage loss (5 %) was noticed with LDPE on 4^{th} days of storage. However, both LDPE and GA_3 100 ppm showed parity with each other. The maximum spoilage loss (32 %) was obtained in control. GA_3 200ppm as a post -harvest dip reduces the decay loss in papaya (Borase *et al*., 2004). Nain *et al* (2000) reported that polythene packed fruits showed a minimum decay loss in comparison to other method of packing. The mean of spoilage was minimum 12.52% with the application of GA3 50ppm over all the days of storage (Table2).

The total soluble solid (TSS) content of majority of treatment increased up to tenth days of storage and decline thereafter till the termination of storage (Table-3) increase in TSS during ripening may be associated with the transformation of pectic substances, starch, hemicellulose or other polysaccharide in soluble sugar and dehydration of fruits (Bhullar *et al*., 1981). After the peak of ripening a decrease in TSS might be declined due to senescence changes after the fruit had attained a climacteric peak. Sahni and Khurdiya (1989) reported similar results in mango. The maximum TSS was found in $GA_3$100 ppm (10.10%) and least (9 %) in control on 10^{th} day of storage (Table-3) GA_3 50 ppm and LDPE was found equally effective...

The maximum total sugar (9.70 %) was observed with the application of GA3 100ppm. Which is equally at par with GA_3 50 ppm and Ca Cl_2 2 %. The TSS and total sugar increased, with storage periods significantly up to the 10th day of storage. These findings are in accordance with those of Patra and Sadhu (1992) and Singh and Mandal (2000) in Litchi

and Borase *et al* (2004) in papaya fruits. The maximum total sugar (9.62%) was observed with the application of GA3 100ppm which was equally effective with the application of GA3 50ppm. (Table - 4).

The marketability of fruits was evaluated on the basis of firmness, softness and rotting of papaya fruits. The maximum marketable yield was found from fruits treated with the application of GA_3 50ppm, which is comparable with LDPE, GA_3 100ppm and NAA 100ppm. These findings are similar to that of Tomi *et al* (1970) and Rao and Chundawat (1984) in banana.

The maximum marketable yield of 87.48% was observed with the application of $GA_3$50ppm. However GA_3 100ppm was also found equally effective in this regard. The maximum marketable yield was on the 4th day of storage and after that decreased significantly.

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APPENDICES

Table 1: Physiological Loss in Weight (%) of Papaya Fruits During Storage under Various Post Harvest Treatments

Treatments	Days for storage				
	4th	7th	10th	13th	Mean
$Cacl_2$ 2%	4.28	5.72	8.80	14.40	8.30
$Cacl_2$ 4%	4.19	6.50	8.82	15.50	8.75
NAA50ppm	4.09	6.10	8.00	13.20	7.85
NAA100ppm	3.91	5.25	7.00	13.10	7.31
GA_3 50ppm	4.84	6.05	8.40	13.50	8.20
$GA_3$100ppm	4.28	4.20	5.40	12.55	6.61
LDPE	4.09	6.00	8.40	13.60	8.02
Newspaper	4.37	7.05	11.50	16.10	9.76
CFB	4.19	7.00	11.20	15.05	9.36
Control	5.21	8.50	12.50	16.50	10.68
Mean	4.34	6.24	9.00	14.35	8.48

C.D. at 5%Treatments (T) =0.4177Days (D)=0.1868

Interaction (TxD) = 0.8353 C.V.6.06

Table-2: Spoilage Loss (%) of Papaya Fruits during Storage Under Various Post Harvest Treatments

Treatments	Days in Storage					
	1st	4th	7th	10th	13th	Mean
$Cacl_2$ 2%	0.00	6.50	10.70	20.48	26.50	16.04
$Cacl_2$ 4%	0.00	6.50	10.80	20.73	27.40	16.36
NAA50ppm	0.00	5.80	9.70	18.23	22.00	13.98
NAA100ppm	0.00	5.60	9.60	17.58	21.00	13.45
GA3 50ppm	0.00	5.50	9.80	13.49	21.30	12.52
GA3100ppm	0.00	5.50	9.70	17.98	20.50	13.42
LDPE	0.00	5.00	9.00	16.98	20.00	12.75
Newspaper	0.00	8.50	13.50	20.18	30.00	18.04
CFB	0.00	5.20	12.40	19.98	26.56	16.04
Control	0.00	8.00	14.00	23.48	32.00	19.37
Mean	0.00	6.21	10.92	18.91	24.75	15.20

C.D at 5 % Treatments (T) =0.7276 Days (D) = 0.3254

Interaction (TxD) =1.455 C.V.4.02

Table 3: Total Soluble Solids (%) of Papaya Fruits During Storage under Various Post Harvest Treatments

Treatments	Days in Storage					
	1st	4th	7th	10th	13th	Mean
$Cacl_2$ 2%	0.00	7.10	9.10	10.80	10.70	9.43
$Cacl_2$ 4%	0.00	7.00	9.00	10.50	10.60	9.28
NAA50ppm	0.00	7.00	8.25	10.70	9.60	8.89
NAA100ppm	0.00	7.15	8.80	11.00	9.60	9.14
GA_3 50ppm	0.00	7.30	9.10	11.80	11.40	9.90
$GA_3$100ppm	0.00	7.20	9.20	12.50	11.50	10.10
LDPE	0.00	7.30	8.50	12.49	11.20	9.87
Newspaper	0.00	7.00	8.15	11.10	10.60	9.21
CFB	0.00	7.30	8.40	12.00	11.00	9.68
Control	0.00	7.00	8.40	9.00	9.00	8.35
Mean	0.00	7.14	8.69	11.19	10.52	9.38

C.D at 5 % Treatments (T) = 0.3629 Days (D) =0.1623

Interaction (TxD) =0.7259 C.V.4076

Table 4: Total Sugar (%) of Papaya Fruits During Storage under Various Post Harvest Treatments

Treatments	Days in Storage					
	1st	4th	7th	10th	13th	Mean
$Cacl_2$ 2%	0.00	8.20	8.55	9.40	9.35	8.88
$Cacl_2$ 4%	0.00	8.10	8.40	9.30	9.25	8.76
NAA50ppm	0.00	7.50	8.10	9.10	8.85	8.39
NAA100ppm	0.00	7.20	7.75	9.50	8.80	8.31
GA_3 50ppm	0.00	8.40	8.90	9.60	9.55	9.11
$GA_3$100ppm	0.00	8.50	9.10	9.70	9.75	9.26
LDPE	0.00	8.00	8.30	9.25	8.80	8.59
Newspaper	0.00	7.20	7.85	8.75	8.25	8.01
CFB	0.00	7.50	8.00	9.10	8.45	8.26
Control	0.00	7.20	7.60	8.20	7.95	7.74
Mean	0.00	7.78	8.26	9.19	8.90	8.53

C.D at 5% Treatments (T) =0.2776 Days (D) =0.1242

Interaction (TxD) =N.S. C.V.4.01

Table 5: Marketability (%) of Papaya Fruits During Storage under Various Post Harvest Treatments

Treatments	Days in Storage					
	1st	4th	7th	10th	13th	Mean
$Cacl_2$ 2%	0.00	93.50	89.30	79.52	73.50	83.96
$Cacl_2$ 4%	0.00	93.50	89.20	79.27	72.60	83.64
NAA50ppm	0.00	94.20	90.30	81.77	77.80	86.02
NAA100ppm	0.00	94.40	90.40	82.42	79.00	86.55
GA3 50ppm	0.00	94.50	90.20	86.51	78.70	87.48
GA3100ppm	0.00	94.50	90.30	82.02	79.50	86.58
LDPE	0.00	95.00	91.00	83.02	80.00	87.25
Newspaper	0.00	91.50	86.50	79.82	70.00	81.96
CFB	0.00	94.80	87.60	80.02	73.44	83.97
Control	0.00	92.00	86.00	76.52	68.00	80.63
Mean	0.00	93.79	89.06	81.09	75.25	84.80

CD at 5% Treatments (T) = 0.7276 Days (D) = 0.3254

Interaction (TxD) = 1.4552 C.V.1.32